

WHAT IS CLAIMED IS:

1. A pattern inspection apparatus comprising:
  - a stage on which a plate to be inspected including a pattern formed on the plate is laid;
  - 5 a light source which irradiates the plate to be inspected with light;
  - a photoelectric device which photoelectrically converts the optical image of the pattern;
  - a detected pattern data generator which generates detected pattern data regarding the pattern based on a signal obtained by the photoelectric device;
  - 10 a reference pattern data generator which generates reference pattern data from designed data regarding the pattern, or stores the detected pattern data obtained by the photoelectric device;
  - 15 a comparator which compares the detected pattern data with the reference pattern data;
  - a light intensity sensor which detects a light intensity of the light;
  - 20 a barometric pressure sensor which detects a barometric pressure in the pattern inspection apparatus;
  - a status detector which senses that at least one of the light intensity and the barometric pressure deviates from a predetermined range;
  - 25 a data memory in which the detected pattern data and the reference pattern data regarding the detected

pattern data at the same time as a time when the status  
detector detects that the at least one of the light  
intensity and the barometric pressure deviate from the  
predetermined ranges are stored in synchronization with  
5 position data on the plate to be inspected and  
a detected value of the at least one of the light  
intensity and the barometric pressure deviating from  
the predetermined range; and

an output device which outputs the detected  
10 pattern data, the reference pattern data, and the  
detected value of the at least one of the light  
intensity and the barometric pressure stored in the  
data memory.

2. The pattern inspection apparatus according to  
15 claim 1, further comprising a focus sensor which  
detects a focus abnormal status of the illumination and  
imaging optics.

3. The pattern inspection apparatus according to  
claim 1, further comprising a vibration sensor which  
20 detects vibration of the stage for the plate to be  
inspected.

4. The pattern inspection apparatus according to  
claim 1, further comprising: a signal intensity profile  
analysis part which analyzes a signal intensity profile  
25 of the detected pattern data at an abnormal status  
time; a re-inspection control part which re-inspects at  
least a part on the plate to be inspected based on

an analysis result of the signal intensity profile analysis part; and an abnormal status notification part which notifies the analysis result.

5           5. The pattern inspection apparatus according to claim 4, wherein the signal intensity profile analysis part compares signal gradients of horizontal and vertical direction components of a pattern edge part of the detected pattern data with a first predetermined standard value, and an intensity and fluctuation of  
10 a signal of a pattern bright part with a second predetermined standard value.

          6. The pattern inspection apparatus according to claim 5, wherein the signal intensity profile analysis part compares the signal gradients of the horizontal  
15 and vertical directions with respect to the pattern edge part of the detected pattern data, and judges that vibration of the stage is generated, when a difference between the signal gradients is not less than the first predetermined standard value.

20           7. The pattern inspection apparatus according to claim 5, wherein the signal intensity profile analysis part compares the signal gradients of different diagonal directions of a pattern corner part of the detected pattern data, and judges that vibration of the  
25 stage is generated, when a difference between the signal gradients is not less than the predetermined standard value.

8. The pattern inspection apparatus according to claim 1, wherein the comparator stores the detected pattern data and the reference pattern data regarding the detected pattern data the predetermined number of times, when the same abnormal status is detected the predetermined number of times in a first predetermined time, and stops storage into the data memory with respect to the same abnormal status until a second predetermined time elapses.

9. A pattern inspection apparatus comprising:  
a stage on which a plate to be inspected including a pattern formed on the plate is laid;  
an electron gun which generates electron beams;  
an electron optics which irradiates the plate to be inspected with the electron beams;  
a secondary electron detector which detects secondary electrons generated from the plate to be inspected;  
a detected pattern data generator which generates detected pattern data regarding the pattern based on a signal obtained by the secondary electron detector;  
a reference pattern data generator which generates reference pattern data from designed data concerning the pattern, or stores the detected pattern data obtained by the photoelectric device;  
a comparator which compares the detected pattern data with the reference pattern data;

a dose sensor which detects a dose of the electron beams;

a barometric pressure sensor which detects a barometric pressure in the pattern inspection apparatus;

a status detector which detects that at least one of the dose of the electron beams and the barometric pressure deviates from a predetermined range;

a data memory in which the detected pattern data and the reference pattern data regarding the detected pattern data at the same time as a time when the status detector detects that the at least one of the dose of the electron beams and the barometric pressure deviates from the predetermined range are stored in synchronization with position data on the plate to be inspected and the detected value of the at least one of the dose of the electron beams and the barometric pressure deviating from the predetermined range; and

an output device which outputs the detected pattern data, the reference pattern data, and the detected value of the at least one of the dose of the electron beams and the barometric pressure stored in the data memory.

10. The pattern inspection apparatus according to claim 9, further comprising a focus sensor which detects a focus abnormal status of the electron optics.

11. The pattern inspection apparatus according to

claim 9, further comprising a vibration sensor which detects vibration of the stage for the plate to be inspected.

12. The pattern inspection apparatus according to  
5 claim 9, further comprising: a signal intensity profile analysis part which analyzes a signal intensity profile of the detected pattern data at an abnormal status time; a re-inspection control part which controls to re-inspect at least a part on the plate to be inspected  
10 based on an analysis result of the profile analysis part; and an abnormal status notification part which notifies the analysis result.

13. The pattern inspection apparatus according to claim 12, wherein the profile analysis part compares  
15 signal gradients of horizontal and vertical direction components of a pattern edge part of the detected pattern data with a first predetermined standard value, and an intensity and fluctuation of a signal of a pattern bright part with a second predetermined  
20 standard value.

14. The pattern inspection apparatus according to claim 13, wherein the profile analysis part compares  
the signal gradients of the horizontal and vertical directions with respect to the pattern edge part of the  
25 detected pattern data, and judges that vibration of the stage is generated, when a difference between the signal gradients is not less than the first

predetermined standard value.

15. The pattern inspection apparatus according to claim 13, wherein the signal intensity profile analysis part compares the signal gradients of different  
5 diagonal directions of a pattern corner part of the detected pattern data, and judges that vibration of the stage is generated, when a difference between the signal gradients is not less than the first predetermined standard value.

10 16. The pattern inspection apparatus according to claim 9, wherein the comparator stores the detected pattern data and the reference pattern data regarding the detected pattern data the predetermined number of times, when the same abnormal status is detected the  
15 predetermined number of times in a first predetermined time, and stops storage into the data memory with respect to the same abnormal status until a second predetermined time elapses.

20 17. The pattern inspection apparatus according to claim 9, further comprising a magnetic field sensor which senses a magnetic field in the pattern inspection apparatus.